**Date\_\_\_\_\_\_\_\_ \_Time 7:20 Subject Cell Transport Project Grade\_10**

**Pennsylvania/National Standards:**

* Keystone Anchor
  + BIO.A.2.2: Describe and interpret relationships between structure and function at various levels of biochemical organization (i.e. atoms, molecules, and macromolecules)
* PDE SAS
  + S11.A.3.2.3 Describe how relationships represented in models are used to explain scientific or technological concepts (e.g., dimensions of the solar system, life spans, size of atomic particles, topographic maps).
  + S11.A.1.1.5: Analyze or compare the use of both direct and indirect observation as means to study the world and the universe (e.g., behavior of atoms, functions of cells, birth of stars).
  + S11.B.1.1.1: Explain how structure determines function at multiple levels of organization (e.g., chemical, cellular, anatomical).
  + S11.B.1.1.3: Compare and contrast cellular processes (e.g., photosynthesis and respiration, meiosis and mitosis, protein synthesis and DNA replication).
* National Science Education Standards
  + Standard C 1.1: Cells have particular structures that underlie their functions. Every cell is surrounded by a membrane that separates it from the outside world. Inside the cell is a concentrated mixture of thousands of different molecules which form a variety of specialized structures that carry out such cell functions as energy production, transport of molecules, waste disposal, synthesis of new molecules, and the storage of genetic material.

**Essential Understanding(s)/Key Concepts/Skills:**

* Review cell membrane structure, cell membrane function, active transport, passive transport, diffusion, osmosis, exocytosis, endocytosis, pumps.

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| **Instructional Objectives** | **Aligned Assessments** |
| 1. Given a project handout, the student will create a visual aide to illustrate the key aspects of cell transport with 80% accuracy based on teacher-designed rubric. | 1. Cell transport unit project |

**Review of Skills/Content:**

The information learned in the previous lessons regarding the cell membrane and cell transport may be reviewed before this lesson. Students will need to recall the information they learned about the structure of the cell membrane and its functions as well as the different types of transport.

**Materials:**

* Student cell transport project handouts
* Construction paper
* Markers
* Colored pencils
* Crayons
* Video cameras (if available)
* Student computers (with PowerPoint and internet access)
* Poster board
* Any student-supplied materials

**Behavioral Expectations:**

Students will be expected to follow all posted school and classroom rules. Students will be expected to pay attention to the teacher and respect the teacher and classmates at all times. Since some students may be working on computers, they will be expected to actively complete their assignments while maintaining focus and staying on-task. Students will also be expected to use the computers carefully so they do not break them. Students who use video cameras will be expected to use caution and only video tape students who have received permission. Students will be expected to use supplies in the way they are intended and not waste them. Students will also be expected to clean up all supplies at the end of the period.

**Methods of Assessment:**

The lesson objectives will be formatively assessed during the lesson through the use of informal questioning. The final product (cell transport unit project) will be collected/presented and will serve as the summative assessment for the unit.

**General/Specific Accommodations for Students (Diverse/English Language Learners):**

In order to accommodate English language learners and students with special needs, access to classroom aides such as textbooks will be provided so students may look up words they are unfamiliar with. The instruction will be delivered clearly and concisely. Responses to questions may be modeled and extra time may be given to complete assignments. Students may be allowed to work in groups. The cell transport unit project activity sheet may be read aloud to students with difficulty reading or understanding the instructions. Students will be allowed to choose which type of project they will do in order to allow them to complete a project that they are comfortable with and capable of doing.

**Instructional Sequence:**

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| **Lesson Implementation** | **Anticipated Student Responses** |
| **Introductory Activity (Anticipatory Set):**  The anticipatory set will consist of the teacher asking the students to share their project ideas (which they should have thought of at home the night before). The students will discuss their project plans and how their project will demonstrate cell membrane structure and the types of cell transport.  The class will then review the daily objective which will be written on the board. | The students should actively participate in the discussion and share their ideas. Some students may not share their ideas so the teacher should find a way to include all of the students in the discussion by asking them questions about their project ideas. |
| **Modeling/Demonstration:**  To begin the modeling/demonstration, the teacher will gain the students’ attention by showing them projects from previous semesters (if this is not the first semester the project is being done). If this is the first semester the project is being done, the teacher will show the students sample projects from the internet such as cell transport posters or cell transport videos on youtube. The teacher will then make sure everyone has their assignment sheet and rubric from the day before and give them to any student that does not have them. | During the modeling/demonstration, it is expected that the students will follow the instruction and pay attention to the instructor. Some students may lack attention so it will be important for the instructor to make sure to maintain student focus during this time. |
| **Guided Practice/Feedback:**  After making sure every student has an assignment sheet and rubric, the teacher will have the class read over the instructions together and then allow the students to get into their groups for the project. The students will begin working on their projects while the teacher goes from group to group in order to see what they are doing and provide constructive feedback to each group. During this time, the teacher will ask guiding questions in order to make sure the students are on the right track and to ensure they meet all of the project requirements. | The students should fully participate in the guided practice and to use the feedback provided by the teacher to guide their learning and help them understand the concepts being taught.  Some students may get off-task and may not be working on their project. The teacher will have to keep an eye on all groups during the period even when helping specific groups in order to keep all students on-task. |
| **Independent Practice:**  After the teacher has met with each group individually and given them feedback on the direction of their project, the students will be left to finish their projects and turn them in at the end of the period. During the independent practice phase, the teacher will still orbit the room from group to group as a resource for any students who get stuck or have a specific question about the content or about their project. | Some students may not want to participate in the activity. The teacher will have to make sure all students are participating and completing their assignment.  Some students may be using the materials improperly, so the teacher will have to keep a close eye on all groups when they are working independently. |
| **Discussion/Essential Questions:**   * How can we put everything we learned in this unit together? * How can we visualize the cell membrane and cell transport methods? | The students should be able to answer these essential questions by the end of the lesson. |
| **Formative Assessment:**  The formative assessment for this lesson will consist of the students’ answers to informal questioning throughout the lesson. The information gained from these assessments will allow the teacher to make sure students understand the key concepts being covered in the lesson and adapt future lessons. |  |
| **Closure (Review/Preview):**  To close this lesson, the teacher will give the students a slip of paper and ask them to write down what they think is the most important thing they learned during this unit. If there is time left, the teacher will lead a class discussion where students share their opinions on this topic. | The students should participate in the discussion and should provide their own unique input. They should also think critically about the information they learned over the course of the unit so far. Some students may not participate, so the teacher should guide them into discussion by asking if they agree or disagree with other students. |
| **Extension Activities:**  The extension activity that will be used if the lesson is finished before the end of the period will consist of asking groups to volunteer to share their projects with the rest of the class. The teacher may also go over the answers to the review pages in the book. | The students should maintain focus while completing this activity, but some may lose focus since the period will be almost over. The teacher will need to help maintain student focus. |

**Correction Procedures/Potential Areas of Difficulty:**

The students may have difficulty remembering all of the topics covered throughout the unit so the teacher will have to be available to answer any questions the students have regarding the material. The students also may have difficulty synthesizing all of the information into one unified project, so it will be important to help them put all of the pieces together. The students may have trouble using some of the materials, so the teacher will have to be ready to demonstrate the use of PowerPoint, video cameras, etc.

**Summative Assessment:**

**Assessment Items**

* The summative assessment will consist of the Cell Transport Unit Project and associated rubric (see attached “Cell Transport Unit Project”)
* This lesson is a review of all previous lessons, so mid-term assessment items will be the same as those from the previous lessons in this unit.

**Answers and Scoring Criteria**

* The summative assessment will consist of the Cell Transport Unit Project and associated rubric. Rubric can be seen below.

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|  | **Possible Points** | **Points Earned** | **Comments** |
| **Structure of cell membrane (Phospholipids & proteins)** | 5 |  |  |
| **Diffusion Representation** | 5 |  |  |
| **Osmosis Representation** | 5 |  |  |
| **Facilitated Diffusion Representation** | 5 |  |  |
| **Representation of Ion Pumps** | 5 |  |  |
| **Endocytosis Representation** | 5 |  |  |
| **Exocytosis Representation** | 5 |  |  |
| **Labels** | 5 |  |  |
| **Descriptions of each process and parts** | 15 |  |  |
| **Description of Passive and Active transport** | 5 |  |  |
| **Total** | 60 |  |  |

* You may receive up to 5 bonus points if you choose to present your project during class at a later time
* This lesson is a review of all previous lessons, so mid-term assessment items will be the same as those from the previous lessons in this unit.

**Modified Assessment Items for Students with Disabilities and English Language Learners:**

* The summative assessment will consist of the Cell Transport Unit Project and associated rubric (See attached “Modified Cell Transport Unit Project”)
* This lesson is a review of all previous lessons, so mid-term assessment items will be the same as those from the previous lessons in this unit.

**Reflections:**

**Sources:**

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Osmosis. (2000, July 2). *Colorado State University Vivo*. Retrieved October 21, 2012, from <http://www.vivo.colostate.edu/hbooks/cmb/cells/pmemb/osmosis.html>

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